Sentinel-1
Mission Status
Sentinel-1

The radar vision for Copernicus
Sentinel-1: C-band SAR mission

- Data continuity of ERS and ENVISAT missions
- Copernicus radar imaging mission for ocean, land, emergency
- Applications:
  - Monitoring sea ice zones and the arctic environment
  - Surveillance of marine environment (e.g. oil spill monitoring)
  - Maritime security (e.g. ship detection)
  - Wind, wave, current monitoring
  - Monitoring of land surface motion (subsidence, landslide, tectonics, volcanoes, etc.)
  - Support to emergency / risk management (e.g. flooding, etc.) and humanitarian aid in crisis situations
  - Mapping of land surfaces: forest, water and soil, agriculture, etc.
Mission profile:

- C-Band SAR at 5.4 GHz, multi-polarisation
- Sun synchronous orbit at **693 km** mean altitude
- **250 km** swath width (Interferometric Wide-swath mode)
- **6 days** repeat cycle at Equator with 2 satellites
- **7 years** design life time, consumables for 12 years
- **4** nominal mutually exclusive operation modes
Sentinel-1 Operational Modes

<table>
<thead>
<tr>
<th>Resolution (1 look)</th>
<th>Swath Width</th>
<th>Polarisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 x 40 m²</td>
<td>&gt; 400 km</td>
<td>HH+HV or VV+VH</td>
</tr>
<tr>
<td>5 x 20 m²</td>
<td>&gt; 250 km</td>
<td>HH+HV or VV+VH</td>
</tr>
<tr>
<td>5 x 5 m²</td>
<td>&gt; 80 km</td>
<td>HH+HV or VV+VH</td>
</tr>
<tr>
<td>5 x 5 m²</td>
<td>20 x 20 km² at 100 km spacing</td>
<td>HH or VV</td>
</tr>
</tbody>
</table>

Main mode over land
Sentinel-1 Systematic acquisition & production concept

Visibility of observation scenario through Discovery Service

Observation Scenario
(implementation of observation scenario within the available spacecraft and GS resource)

Regular Satellite tasking

Regular Instrument sensing

Regular Data acquisition

COPERNICUS Users

DAP/HLOP

Observation needs

S1 regular commanding activity

S1 Ground Segment

Sentinel-1 Systematic acquisition & production concept
With the Sentinel-1 instrument characteristics and mission operations concept, data volume handling is a major challenge both for Ground Segment operations and also for user data access and management:

- **Systematic generation of Level-0 products: about 1.5 TB per day** (both satellites) to be generated, real time quality checked and archived.

- **Systematic processing to Level-1 products: about 1.7 TB per day** (both satellites) to be generated, real time quality checked and archived.

- **To be disseminated to users with an on-line data access**

  - **X-band raw data**: 150 Mbps average sustained rate
  - **Sentinel-1 Core PDGS**: ingestion, data circulation, L0 processing, L1/2 processing, radio/geo calibration, QC, archiving...
  - **Sentinel-1 Core operational user Products**: 300 Mbps average sustained rate
Sentinel–1 mission status

- Sentinel-1A launched on 3 April 2014 on Soyuz from Kourou
- Nominal orbit reached on 7 August 2014
- Sentinel-1A commissioning phased completed on 23 September 2014
- Sentinel-1A Operational Qualification phase on-going (see next slide)
- Data flow opened to all users on 3rd October 2014
- Satellite and ground segment status and performance are nominal
- Operational set up to support the Charter planned in the coming weeks
- Sentinel-1B satellite under procurement, launched foreseen in early 2016
Weekly Mission Status Reports

https://sentinel.esa.int/web/sentinel/missions/sentinel-1/mission-status

Mission Status Report 1
Reference Period: 3 April - 7 April 2014

Mission Status
- Sentinel-1A was successfully launched from Kourou on 3 April 2014, 21:02 UTC
- The Launch and Early Orbit Phase (LEOP) was successfully performed according to the planned timeline and declared closed on 6 April at 18:00 UTC
- The Commissioning Phase has started

Satellite
- The LEOP covered the main following key activities:
  - Deployments of the solar panels (including rotation) and of the Synthetic Aperture Radar (SAR) antenna
  - Achievement of Satellite Nominal Mode and AOCs Nominal Pointing Mode
  - Switch ON and initial colds of the spacecraft sub-systems
  - First operations of the X-Band Trans-mitter and the SAR instrument (3 min of Wave mode)

In addition, a collision avoidance manoeuvre was performed on 5 April

Ground Segment
- The Flight Operations Segment performed normal during the complete 3 days of LEOP
- First X-band data acquisition took place at the Malaga ground station on 6 April, early morning
- First SAR instrument data acquisition was performed on 6 April. The related measurement was successfully preprocessed at UK-PAC
- The FOG and the PDFFG were declared ready to support the commissioning phase

Outlook
- Start of platform and payload commissioning activities
- Final SAR acquisitions driven by the operational PDFFG mission planning system are planned to start on 9 April, as part of the initial verification and calibration activities
- Start of orbit manoeuvre sequence to acquire the target reference orbit

Mission Status Report 4
Reference Period: 25 April - 30 April 2014

Mission Status
- The satellite Commissioning Phase is ongoing
- This orbit acquisition strategy to reach the reference orbit is under finalisation. The first orbital manoeuvres to raise the orbit altitude started on 29 April

Satellite and Ground Segment
- The Commissioning Phase activities are ongoing, with the modifications associated to the lower injection orbit (7.8 km) and to the consequent longer duration of the reference orbit acquisition phase
- The characterisation of the propulsion sub-system has continued based on the execution of both in-plane and out-of-plane calibration manoeuvres
- The satellite is in Nominal Mission Mode (NM), with all sub-systems working on prepared profiles, and with the Attitude and Orbit Control System (AOCs) in the operating Normal Pointing Mode (attitude steering enabled, except during SSM readouts)
- An unavailability of the SAR occurred on 29 April. SAR operations were rescheduled on 30 April
- The SAR payload is planned through the PDFFG mission planning system. Frequency supplies of the planes are performed based on the evolution of orbital parameters due to the orbit manoeuvres
- The overall FOG and PDFFG status and performance are nominal

Outlook
- Continuation of the satellite commissioning activities
- Continuation of orbit manoeuvres to reach the reference orbit
- A press event on the ‘Sentinel-1A first images with demonstration of applications’ is planned on 8 May 2014 in Brussels

Report prepared by the ESA Sentinel-1 Team
The Sentinel-1 full mission exploitation capability is based on the routine operation of the 2-satellites constellation.

Mission exploitation capacity is gradually achieved from Sentinel-1A launch to routine operations before the Sentinel-1B launch.
Sentinel-1 data access status

Start of S1 sample user products access to “any” user: 9th May

Opening of reference sites products to expert users: 14th Aug.

Start of regular access to MyOcean data sets to the COPERNICUS MyOcean Service: 30th Sep.

Start of regular access to all S1 user products to “any” user: 3rd Oct.

Space Segment Commissioning phase

Sentinel-1A Operational qualification (S1A)

S1A Routine Operations

S1A Launch

S1A IOCR

S1A RORR
Sentinel-1A Data Flow

Open to all users since 3rd October at:

https://scihub.esa.int
### USE TYPOLOGIES

#### Copernicus Services
- Copernicus Core & Downstream Services

#### Other EU needs assimilated to Copernicus services
- e.g. EMSA, EEA, EUSC, JRC

#### Scientific /Other use
<table>
<thead>
<tr>
<th>Science use</th>
<th>Public Value Adding use</th>
<th>Commercial Value Adding use</th>
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#### MSs CollGS
- ESA/EU Member States needs (Collaborative GS)
- ESA funded R&D projects

#### Int’l Agreements
- International Agreements
Arctic, 1 cycle
Antarctic, 1 cycle
Thank you for your attention!

EU Copernicus web site: http://www.copernicus.eu/

Sentinel Online web site: http://sentinel.esa.int